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The Director of Central Intelligence

Washington, D.C. 20505



Intelligence Research &
Development Council

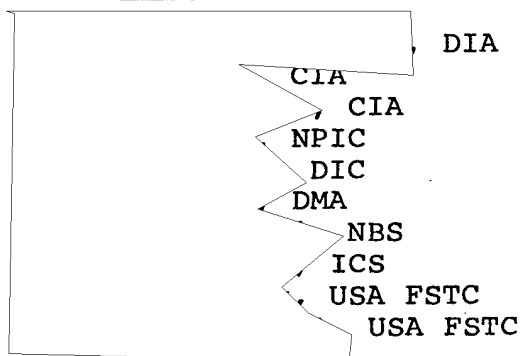
ARTIFICIAL INTELLIGENCE STEERING GROUP
MEETING MINUTES

DATE/PLACE

27 August 1984
National Bureau of Standards
Gaithersburg, Maryland

ATTENDEES

AISG



NEXT MEETING

Our next meeting will be held on Monday, 24 September, at 1330 hours in Room 1S06

ANNOUNCEMENTS

will be leaving government services to go to industry beginning 1 September. He will be joining Smart Systems Technology in McLean as the Vice President for Federal Systems.

will appoint a new Executive Secretary shortly.

BUSINESS

reported that things are progressing well for the next AI Symposium to be held 19-21 March 1985 at DIA Headquarters. Similar to last year's effort, this year we plan to supplement the program of speakers from government, industry, and academia with a series of ten or so small working groups on topics of particular interest. These groups will discuss such areas as data support for analysts, image understanding, signals interpretation, collection management, strategic defense, indications and warning,

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and others. At the final session of the Symposium the working group chairpersons will present the major issues identified by each group.

[] is seeking volunteers to participate on Symposium planning committees. Anyone interested in serving with the Program, Logistics, or Administrative/Protocol committees should please call him on []

25X1

25X1

Our memorandum with recommendations concerning AI and Intelligence has been sent to Dr. DeLauer. The content was unchanged from the draft that was sent out for comment last month. Our next steps will depend upon IRDC's response.

One area of interest to the Steering Group is the establishment of some kind of regional university consortium involving such institutions as Maryland, George Washington, Carnegie-Mellon, Pittsburgh, Penn State, Pennsylvania, and Rutgers (among others), along with government AI laboratories. A model for such a consortium exists at RADC.

The Steering Group is still interested in establishing a "Blue Ribbon Panel" of AI experts to advise the Community.

[] has drafted a plan for managing such a panel. The group discussed the issue of how to compensate the members of the panel and considered the relative worth of clearances and access to program information versus strict monetary remuneration. Dr. Eckman indicated that CIA/ORD is interested in taking the lead in getting the panel started in FY85.

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The group agreed to postpone our next trip to the West Coast until after the new fiscal year. Several organizations have invited us to visit including GTE Sylvania, Fairchild, and AI&DS. Others who would be likely candidates are Hughes, TRW, ESL, and Xerox. An early duty of the new Executive Secretary will be to begin planning this week-long trip, perhaps for the latter half of October.

[] introduced several AI-related efforts which the National Bureau of Standards (NBS) is currently pursuing. These include activity in software development, speech recognition, and automated manufacturing.

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[] described NBS efforts in Using Knowledge in Software Development. They have three projects underway in (1) assisting language syntax generation (PASCAL), (2) suggesting appropriate tools available in UNIX to address a given task, and (3) studying advanced architectures for AI which involve distributing processes among UNIX, OPS-5, and LISP on a Symbolics 3600. A copy of his viewgraphs is attached.

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[] began his discussion of NBS work in Speech Recognition by distinguishing between the early ARPA Speech

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Understanding Project and the current DARPA Speech Recognition Project. One outcome of the early work in Speech Understanding was the realization that the low-level acoustic signal contained more information than was originally expected. The new program acknowledges the importance of acoustics and Dr. Hieronymus described three related efforts: (1) [redacted] at MIT has demonstrated remarkable success in visually reading voice spectrograms and identifying phonemes; (2) Carnegie-Mellon is pursuing the use of special acoustic/phonetic features; and, (3) NBS is just beginning several contractual efforts to address the analysis of coarticulation in continuous speech. They are planning a ten-year program in this area to increase vocabulary size and branching factors complexity. NBS is focusing their speech work on basic research. Their principal customer in this area is DARPA in a joint program effort. NBS is also serving as a clearinghouse for speech data bases. A set of viewgraphs is attached.

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[redacted] presented a talk and film on NBS Automated Manufacturing Research Facility which concerns the use and hierarchical control of robots in a manufacturing environment. The role of NBS in this area is to provide measurement assurance and to develop standards for automated manufacturing. To assist in research in this field, they have created an Automated Manufacturing Research Facility (AMRF) to serve as a national testbed for use by other agencies, universities, and industry. They have established a program of research associates from these segments and now have over 100 people working on the AMRF across several divisions of NBS. Most of their funding has come from the Navy, and about half of their equipment has been donated by U.S. industry.

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A research topic of particular interest is a five-level hierarchical robot control system involving the actual robot operations, a workstation to plan operations, a cell to plan how to make a part and to monitor progress, a shop to handle several orders and schedule the production, and a facility to do long-term scheduling and order raw materials. While the control system is hierarchical in nature it emphasizes parallel processing with local intelligence and communication through a common memory. They are investigating the role of AI in all this and its impact on real-time control. The key seems to be knowing at what level in the hierarchy to make what kinds of decisions.

The system is currently oriented toward fabrication and is designed for low-volume production (like one of a kind). The facility employs a variety of hardware and software with a focus on developing a standard user interface

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[redacted]
Chairman, AI Steering Group

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EXPERT SYSTEMS

IN SPEECH

RECOGNITION

- I. ARPA SPEECH UNDERSTANDING PROJECT
- II. DARPA SPEECH RECOGNITION PROJECT

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ASSUMPTIONS IN ARPA SUR PROGRAM

- 1) ACOUSTIC SIGNAL DOES NOT CONTAIN ENOUGH INFORMATION FOR
SPEECH UNDERSTANDING
- 2) HIGHER SOURCES OF KNOWLEDGE-SYNTAX, SEMANTICS, PRAGMATICS
ARE MOST IMPORTANT

RESULTS OF SUR PROJECT

- 1) 42 - 60 % PHONEME RECOGNITION
- 2) 80 - 97% WORD RECOGNITION
(HEAVY SYNTAX CONSTRAINT IN HIGHER ACCURACY)
- 3) 48 - 95% SENTENCE UNDERSTANDING

184 SENTENCES MALE & FEMALE SPEAKERS
1011 WORD VOCABULARY BRANCHING FACTOR 33-196

ASSUMPTIONS IN DARPA SR PROJECT

- 1) ACOUSTIC SIGNAL CONTAINS ALL THE INFORMATION NECESSARY
FOR SPEECH RECOGNITION (SPECTROGRAM READING EXPERIMENTS)
- 2) HIGHER SOURCES OF KNOWLEDGE - SYNTAX, AND PRAGMATICS
ARE ALSO IMPORTANT

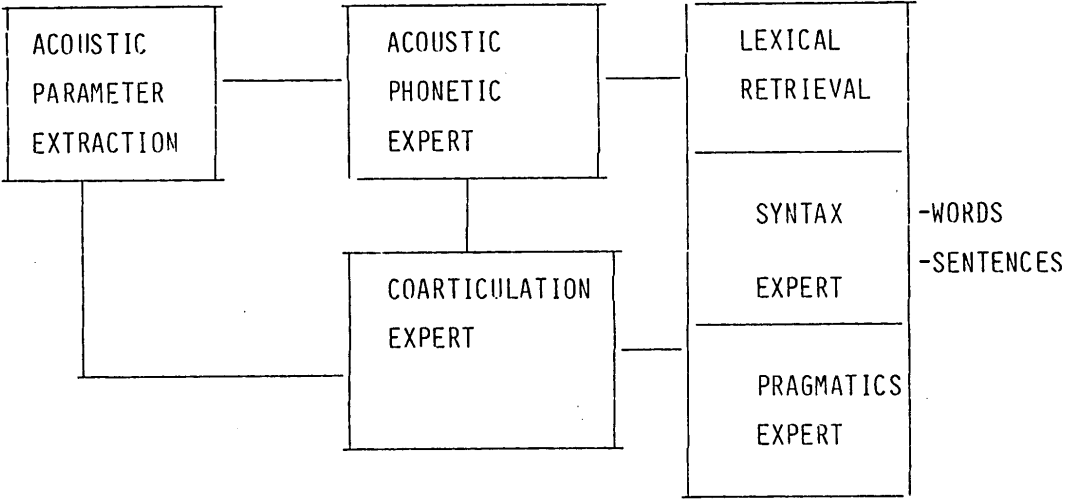
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EXPERT KNOWLEDGE TO BE INCLUDED

- 1) SPECTROGRAM READING
 - A) SEGMENTATION
 - B) PHONEME RECOGNITION
- 2) ACOUSTIC-PHONETIC FEATURES
- 3) COARTICULATION

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SR SYSTEM OVERVIEW



USING KNOWLEDGE
in
SOFTWARE DEVELOPMENT

3 DEMOS



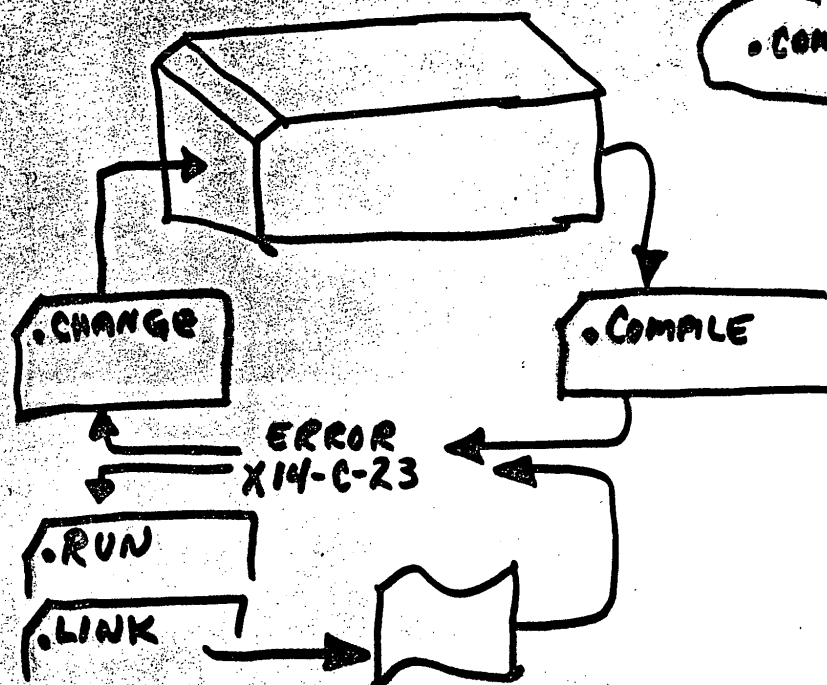
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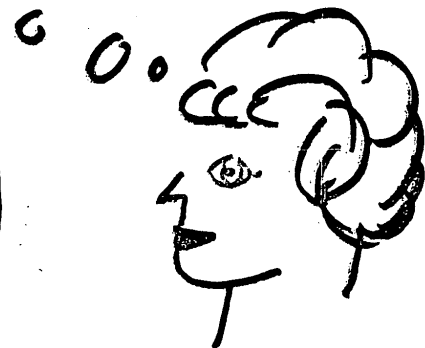


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OLD PARADIGM (CRUDE)



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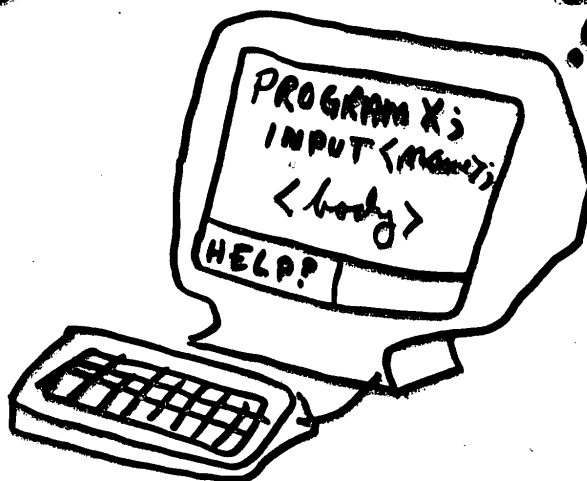
MOTIVATION FOR CHANGE

- + MACHINES for development are CHEAP
- + COMPUTERS do BOOKKEEPING WELL
- + MICROS HAVE FINE Response
- PEOPLE = EXPENSIVE, EASILY BORED, ...

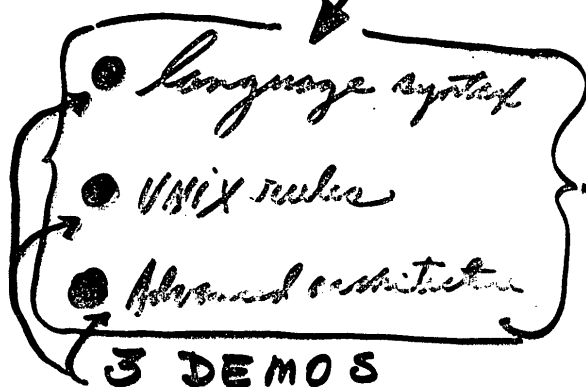
NEW PARADIGM (let machine do it)

FILE → BRANCH &
BOUND
FILE ←

RULES
FACTS
ETC.



KNOWLEDGE-BASED, WORKSTATION (PIECES)



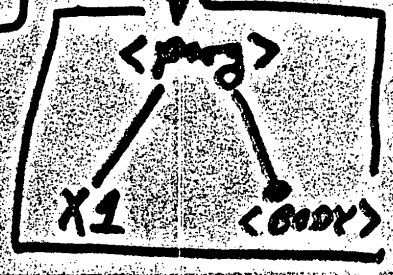
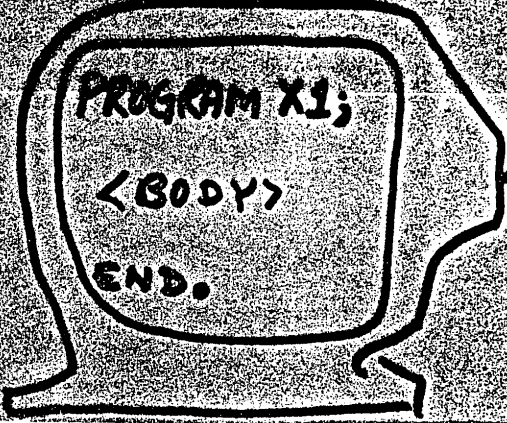
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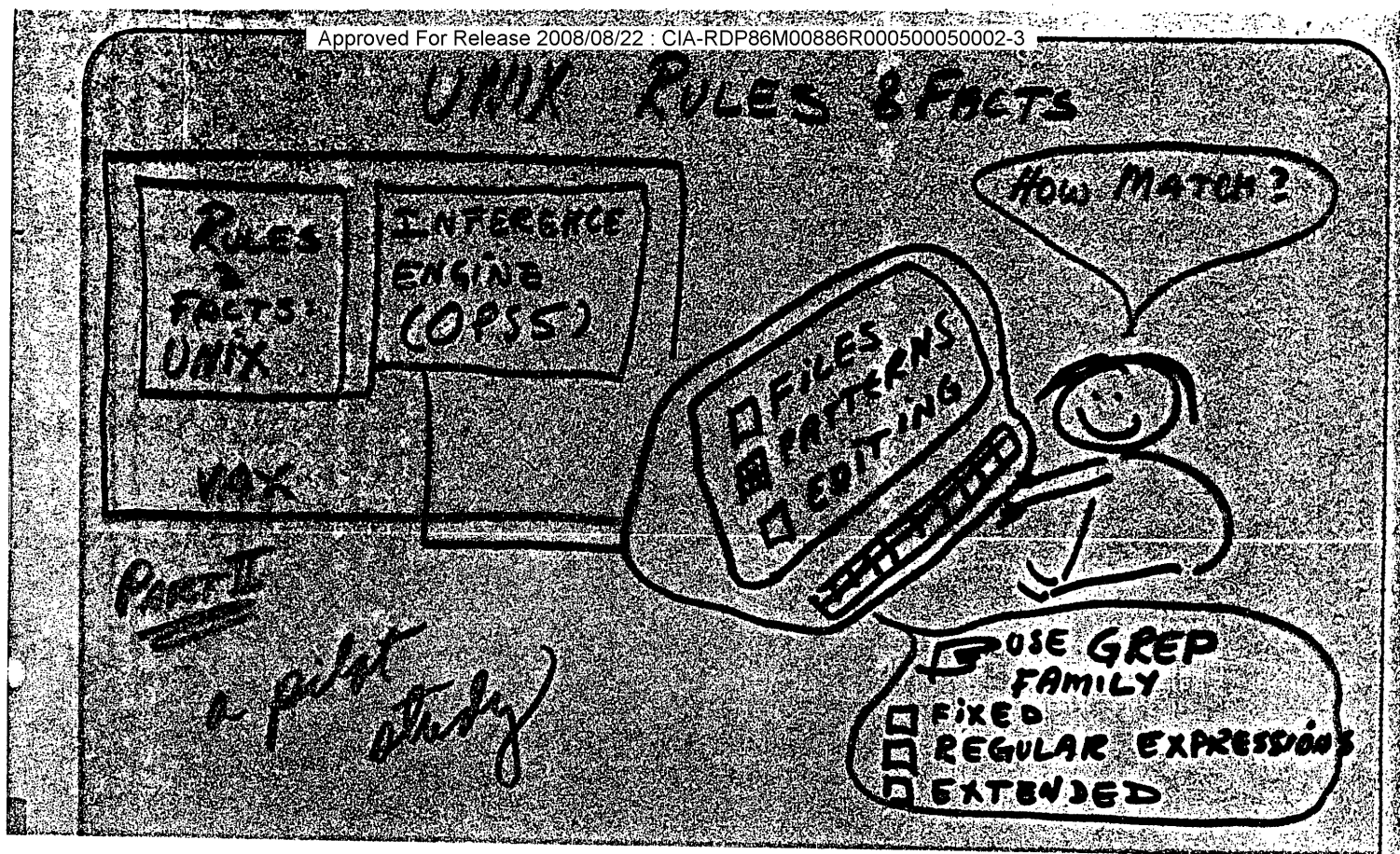
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SEMANTICS
OF RUN-TIME

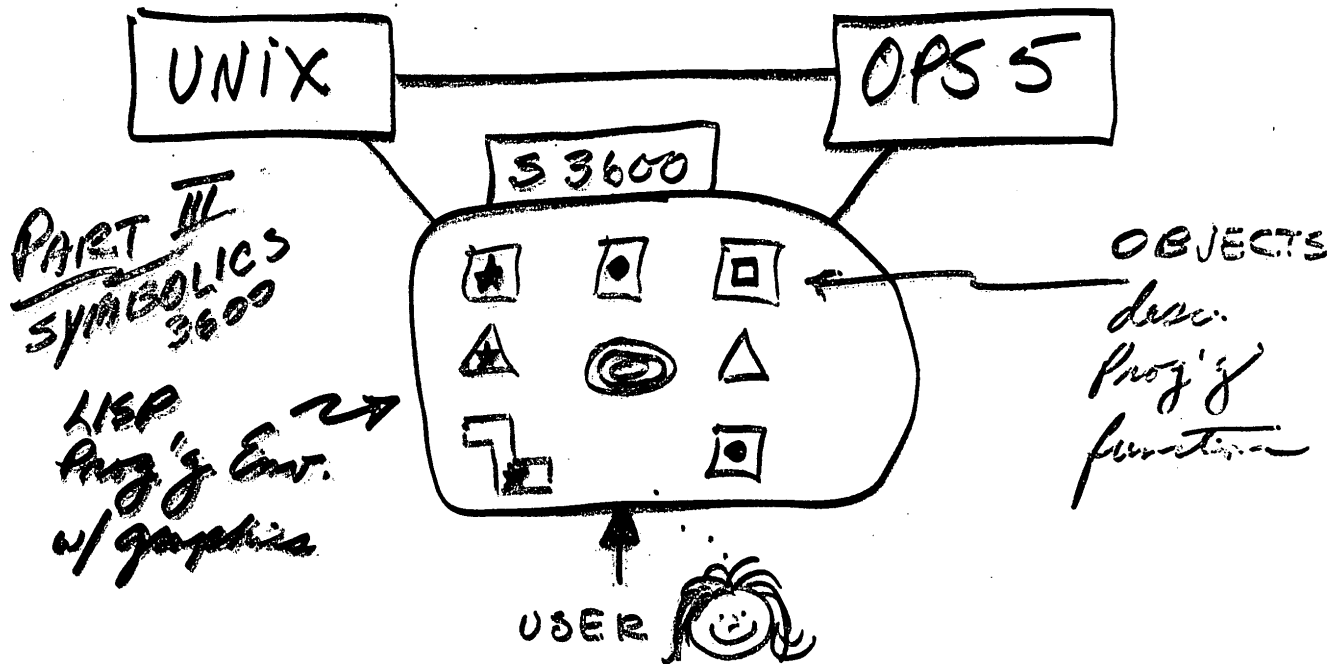
CONSTRUCTOR-
EXECUTOR

PART II
for PASCAL
≤ 4500 lines





ADVANCED ARCHITECTURE



SUMMARY (3 items)

- LANGUAGE-BASED SYSTEM
(PASCAL NOW)
- EXPERT SYSTEM PILOT STUDY
(UNIX)
- ADVANCED ARCHITECTURE
(3600, OBJECTS, GRAPHICS)

CONCLUSION

EVENTUALLY ---- GET ----

- BEGINNING-TO-END IN MACHINE
(NO FORMS, PAPER, TAPES, ...)
- MEANINGFUL ASSISTANCE BY MACHINE
(LESS DRUDGERY)